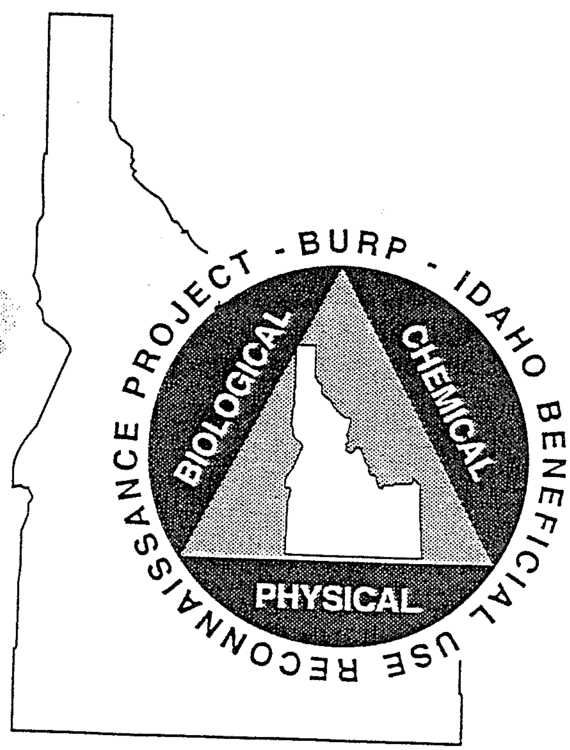
1996 Beneficial Use Reconnaissance Project Workplan



State of Idaho Division of Environmental Quality

1996 Beneficial Use Reconnaissance Project Workplan

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Prepared for
State of Idaho

by
Idaho Division of Environmental Quality Beneficial Use Reconnaissance Project
Technical Advisory Committee

Table of Contents

Introduction

This Beneficial Use Reconnaissance Project (BURP) workplan was developed internally by the Idaho Division of Environmental Quality (DEQ) Technical Advisory Committee (TAC). The committee comprises at least one representative from each of the six DEQ Regional Offices and three Central Office (Boise) technical staff. The first version was written in 1994 and a second in 1995. The workplan is modified annually by the TAC to incorporate changes in methods and protocol. It is used as the guide for training field crews and is designed to provide statewide consistency to monitoring.

The workplan describes the methods used by the DEQ to measure water quality, beneficial use attainability, beneficial use status, and general stream health. The protocol described in the workplan are meant to provide a reconnaissance level screen of stream conditions. The TAC considered time constraints, staff limitations, and cost effectiveness in developing the workplan and selecting the protocol to be used. The overall process strives to be a balance between using the best technology available and the need to assess hundreds of streams over a five-year cycle.

Background

In 1972, Congress passed public law 92-500, Federal Water Pollution Control Act, commonly known as the Clean Water Act (CWA). The objective of this act is to "restore and maintain the chemical, physical, and biological integrity of the Nations's waters." The Federal Government, through the Environmental Protection Agency (EPA), assumed the dominant role in directing and defining water pollution control programs across the country. The act and the programs it generated have changed significantly over the past 20 years as experience and perceptions of water quality have changed. The CWA has been amended 15 times since 1972, most significantly in 1977, 1981, and 1987. The DEQ is the state agency responsible for implementing the CWA in Idaho. The EPA oversees Idaho and certifies that it is fulfilling the requirements and responsibilities of the CWA.

The 1977 and 1981 amendments primarily covered construction grants for municipal and industrial dischargers. The 1987 amendment reaffirmed State responsibility for implementing the CWA and created §319. This section of the CWA deals with nonpoint source (NPS) assessment and development of management programs for state waters. Much of what had been learned about nonpoint pollution sources and their control are covered by this section.

One of the national goals listed in the 1977 amendment is protection and management of waters to insure "swimmable and fishable" conditions. This objective, coupled with the original 1972 objective of restoring and maintaining the chemical, physical, and biological integrity, relates water quality with more than just chemistry. The CWA recognizes that water quality has three major components: (1) chemical; (2) physical; and (3) biological, which is dependent on the former two. Section 303(c)(2)(B) of the CWA states, "... such States shall adopt criteria based on biological monitoring or assessment methods." Section 304(a)(1) of the CWA states, "State's shall develop and publish criteria for water quality accurately reflecting the latest scientific knowledge ... on the effects of pollutants on biological community diversity, productivity, and stability, including information on the factors affecting rates of eutrophication and rates of organic and inorganic sedimentation for varying types of receiving waters."

Point source pollution was the first element addressed under the original 1972 CWA. This was done for several reasons. Primarily because it was known that the municipal and industrial discharges were contributing a large portion of the pollution load to surface waters, and these point sources could be easily identified. Remediation and cleanup of these point sources were expensive and have resulted in significant improvements in the chemistry of waste water entering surface waters from point sources.

Programs to control nonpoint source pollution, however, were and remain today, largely unsuccessful because of the difficulties involved in applying point source approaches to diffuse NPS problems (Karr 1991). Karr also noted that efforts to measure or gauge water quality improvement have not been successful because of an inability to associate water quality standards with biological integrity. The realization that water quality standards do not always relate to biology and the complexities of NPS pollution has led water quality authorities to embrace the concept of ambient monitoring of biological integrity as a direct, comprehensive indicator of ecological conditions. Growing recognition of the importance of non-point sources, particularly in the sparsely populated western states, led to the development of a whole watershed based approach to water quality protection in Idaho (Monitoring and Technical Support Bureau 1994).

Water quality standards are legally established rules consisting of two parts, designated uses and criteria. Designated uses are those beneficial use listed in the Idaho Water Quality Standards and Wastewater Treatment Requirements. Criteria are the conditions presumed to support or protect the designated uses (Karr 1991). This dual nature of water quality standards demands an assessment of the status of beneficial uses and their attainability in addition to classic evaluation of numeric criteria. Protocols were developed by DEQ for assessing use attainability (Maret and Jensen 1991).

In 1993, the DEQ embarked on a pilot program aimed at integrating biological and chemical monitoring with physical habitat assessment as a way of characterizing stream integrity and the quality of the water (McIntyre 1993). The 1993 pilot program had two objectives: 1) to determine the usefulness and feasibility of assessing water quality, ecological integrity, and beneficial use status by monitoring key chemical, physical, and biological parameters; and 2) to complete the monitoring as economically and quickly as possible. The project demonstrated the two objectives could be met and the data collected could be used in a variety of ways (Steed et al. 1994). Because of the success of the 1993 pilot, the DEQ decided to expand the project statewide for 1994 (McIntyre 1994, Steed and Clark 1995). A TAC was formed to evaluate the 1993 effort and arrive at a definitive workplan for 1994 (McIntyre 1994). The TAC consisted of technically orientated personnel in each Regional Office and the Central Office. The 1995 Workplan was developed based on the experiences of the preceding two years. The overall program remains unchanged for 1996, however, some modification of procedures and protocol has occurred in an effort to minimize qualitative information and increase accuracy in water quality assessments.

Beneficial Uses

The waters of Idaho are protected with different water quality criteria depending on their designated or existing beneficial uses as listed in the Idaho Water Quality Standards and Wastewater Treatment Requirements. Idaho's designated beneficial uses are as follows.

- Agricultural Water Supply
- Domestic Water Supply
- Industrial Water Supply
- Cold Water Biota
- Warm Water Biota
- Salmonid Spawning
- Primary Contact Recreation
- Secondary Contact Recreation
- Wildlife Habitat
- Aesthetics

There are three general categories of beneficial uses: Designated (those uses listed in the Water Quality Standards and Wastewater Treatment Requirements), Existing (those uses which have been attained on or after November 28, 1975 in the waterbody), and Attainable (those uses that with improvements to the waterbody can be supported in the future). Only a small number of the waterbodies in Idaho currently have designated beneficial uses listed in the Water Quality Standards and Wastewater Treatment Requirements. Those listed are typically the larger rivers and lakes. The beneficial uses are unknown on most of the smaller waterbodies in Idaho.

Purpose

There are several purposes behind the Workplan. The most important are:

1. provide statewide consistency in the monitoring, data collection, and reporting as described in the Coordinated Nonpoint Source Water Quality Monitoring Program for Idaho (Clark 1990);

2. develop a protocol applicable to any wadable stream regardless of location or locality in Idaho; and

3. identify the principal measures that likely provide significant insight into stream ecology, biology, and water quality, and determine their relation to beneficial uses.

Objectives

The objectives of the BURP are:

1. determine beneficial use attainability to the extent possible at a reconnaissance level intensity; and

2. determine beneficial use support status, which includes characterizing reference stream conditions.

Scope

As stated in the name, this is a reconnaissance level monitoring effort. Thus the reader should realize there are limits on how much interpretation can be done with the type of data collected through this process. The BURP is intended to merely differentiate between impaired and non-impaired streams. It is not intended to identify pollutants or their sources. However, it may be possible to suggest causative agents through a synthesis of all existing data, be it BURP or other supporting evidence. Refinement of causative agents, quantification of their effects, and likely sources will be dependent on subsequent monitoring above and beyond the initial scope of BURP.

Rationale for Stream Selection

Idaho has many diverse environments within its borders. Thus, criteria for selecting streams to monitor must be flexible enough to address the range of conditions encountered. To assist in prioritizing monitoring efforts, the TAC identified the following five categories of streams to be considered when the Regional Offices select streams for monitoring:

1. Water Quality Limited Streams [per §303(d) in the CWA];

2. streams with reference conditions (Plafkin et al. 1989, Harrelson et al. 1994);

3. streams with little or no monitoring information;

4. Cumulative Watershed Effects Process streams identified by the Idaho Department of Lands; and

5. streams recommended by the Basin Area Groups.

The convention for naming streams follows the "Geographic names information system (GNIS) Idaho." (U.S. Geological Survey 1995). A list of streams that have been selected for monitoring in 1996 can be found in Appendix I.

Methods

Stream Site Selection

Robinson and Minshall (1992, 1994) reported ecoregion stratification represented real differences in biotic communities. The BURP process further stratifies to watersheds. Within watersheds, streams are selected for monitoring based on the rationale stated earlier.

Ecoregion - Watershed - Stream - Reach - Site - Habitat Unit

Sites are thought of as "samples" of the entire reach. Beneficial use attainability and support status conclusions about stream reaches or entire streams are based on data collected from relatively small sample sites (20 times mean stream width). The determination of beneficial use support status relies on making habitat and biotic data comparisons between study streams or reaches and reference conditions. Consequently, sample sites should be both **comparable** between streams and **representative** of the entire stream reach being assessed.

To make valid comparisons between study streams and reference conditions, sample sites should be similar. To apply conclusions to longer stream reaches or entire streams the sample sites must be representative. Representative sampling can be accomplished by:

6. a "**preplanning**" office step, which involves consulting with other resource agency representatives, search and examine existing stream data, aerial photo investigation;

7. selecting several reaches that cover the potential range of variability determined above; and

8. selecting a few sites in the field that are determined to be the most representative of the stream reach or entire stream.

The DEQ Guidelines for Determining Beneficial Use Attainability and Support Status (draft document, October 6, 1994) recommends that BURP reaches should not represent multiple stream orders. In other words if a stream has three orders, then at least one reach per order must be established to determine beneficial use attainability and support status for the entire stream. Regional BURP Coordinators should consider both Rosgen stream type(s) and stream orders in choosing reaches for BURP crews to assess. It should be noted that access is a criterion taken into consideration when selecting a stream site in BURP.

Single channel sites are preferred to split channel sites. When a split channel is unavoidable, the BURP survey should be conducted in the channel that contains the majority of the flow.

Core Parameters

Monitoring parameters and methods were selected based on the BURP objectives. Since both objectives focus on beneficial uses, many parameters relate directly to those uses, for instance, salmonid spawning, cold water biota, and primary and secondary contact recreation. Where beneficial use attainability and support status cannot be evaluated directly, a surrogate measure is selected. In the case of support status, the DEQ elected to use a biological assemblage and habitat comparison system similar to the one in Plafkin et al. (1989). A minimum number of parameters are needed to adequately characterize reference stream conditions to determine the level of beneficial use support, i.e., full support or not full support in this approach. Minshall (1993) also suggested using multiple measures because "it is unlikely that any one measure will have sufficient sensitivity to be useful in all circumstances."

The TAC reviewed similar projects in the Pacific Northwest as well as research studies for parameters and measures that yielded environmentally and biologically relevant information or results. The BURP objectives and relevant studies formed the basis for the TAC's selection of parameters for inclusion in this project. These methods are the core parameters (Table 1). Each Regional Office field crew will measure the core parameters throughout the state, regardless of their location. Conquest et al. (1993) and Clark (1990) noted that standardization of field methods is essential to ensuring reliable data, and tailoring of published methods to site conditions is reasonable and valid. A standardized equipment list (Appendix II) and field forms (Appendix III) are provided to the BURP field crews.

Table 1. 1996 Core Parameters List.

Parameter	Method Reference	Level of Intensity
Flow	Harrelson et al. 1994	one measurement per site; set interval method
Width/Depth	Bauer and Burton 1993. pg. 86	measure wetted and bankfull conditions at three riffle habitat units; record cross-sectional depth at a minimum of ten locations
Shade	Bauer and Burton 1993. pg. 68	measure with a densiometer at three riffle habitat units; use habitat types and lengths to weight calculations for stream site shade calculations
Bank Stability	Bauer and Burton 1993. pg. 98	longitudinal (total stream site length) for both stream banks

Parameter	Method Reference	Level of Intensity
Substrate	Wolman 1954	at three riffle habitat units; a minimum of 50 counts per riffle; set interval method
Habitat Types	Meehan 1991	longitudinal; classify as pool, glide, run, riffle
Pool Complexity	Bauer and Burton 1993. pg. 119	measurements taken in a minimum of three pools, length, maximum width, maximum depth, and depth at pool tailout
Large Organic Debris	Platts et al. 1987. pg. 83	LOD > ten centimeters diameter and > one meter in length; within bankfull zone of influence (applicable only in forested situations)
Stream Channel Classification	Rosgen 1994	to letter classification only (A,B,C, etc.)
Habitat Assessment	Hayslip 1993	follow habitat assessment protocol
Temperature	Franson 1995	instantaneous temperature measurements
Photopoints	Cowley 1992	photographs upstream and downstream at lower end of each site; record directions in which photographs are taken
GPS	Trimble 1995	collect uncorrected (raw) data
Macroinvertebrates	Clark and Maret 1993	Hess sampler, with 500 μm mesh at three riffle habitat units (n=3); samples preserved and stored separately in the field; laboratory personnel composite the three samples, count, and identify the first 500 individuals; Surber or kick net samplers used if conditions do not permit use of a Hess sampler
Fish	Modified from Chandler et al. 1993	collect fish in the study site or an equivalent length of stream which includes all habitat types encountered in the study site; collect, count, and voucher specimens (6 individuals if possible) for each species; measure total length of all salmonids

The TAC was concerned with the reliability, variability, and repeatability of measurements. Platts et al. (1983) evaluated the accuracy and precision of some of the parameters listed above. Some were found to have lower confidence intervals than others, especially if they were rated as opposed to measured, though measured parameters had problems as well. They found measurements for stream width and depth to have good to excellent precision and accuracy. Subjective measures of percent pool and pool quality had good to fair precision, but generally fair to poor accuracy. Hogle et al. (1993) found ratings and measured values for streambank characteristics to have the highest variability. They concluded more quantitative definitions and measurements would reduce the variability associated with subjective ratings. Furthermore, Roper and Scarnecchia (1995) reported on "observer variability" in doing habitat surveys. In light of these findings, the TAC selected quantitative measures wherever possible rather than subjective ratings.

Pilot Investigations to Validate Procedures

BURP Pebble Count

The BURP process has used a modified Wolman Pebble Count (Wolman 1954) to quantify substrate size distribution in riffle habitats. This BURP pebble count method relies on the relation of pebble to surface fines (defined as material <6.35 mm Chapman and McLeod 1987) as an index of sedimentation and beneficial use impairment. Sediment and its accumulation is critical to salmonid spawning (a beneficial use) since it limits the quality and quantity of the inter-gravel spaces that are critical for egg incubation (Maret et al. 1993, Young et al. 1991, and Scrivener and Brownlee 1989).

In 1996, the BURP TAC has included a pilot comparison of the BURP pebble count method to a method described by Bevenger and King (1995). This latter method is referred to as the "zig-zag method," which samples substrate in a systematic pattern over all habitats within a site. The method of particle selection and measurement (intermediate axis) is similar to the pebble count method. The difference is that the zig-zag method measures the entire site in a zig-zag pattern longitudinally instead of in a transect pattern perpendicular to the stream bank.

In 1996, each DEQ Regional Office will conduct at least five site surveys using both the BURP pebble count and zig-zag methods. This approach will provide, approximately, 30 comparisons over several geographical areas to test the similarities and differences between these two methods.

Rationale For Parameter Selection And Summary of Procedures

Flow

Minshall (1993) noted flow was one of the principal abiotic factors shaping stream ecosystems. Flow is one in a series of measurements taken by both Oregon and Washington in very similar bioassessment projects (Mulvey et al. 1992, Plotnikoff 1992). The DEQ is using the methodology described in Harrelson et al. (1994).

Locate a straight non-braided stretch of the site to be sampled. Place a measuring tape across the stream perpendicular to the flow and take at least ten evenly spaced velocity measurements from wetted bank to wetted bank. Record the horizontal distance measured from the tape, depth from the top-setting wading rod, and velocity from the electromagnetic velocity meter.

Width/Depth

Widths, depths, and width to depth ratios were found by Robinson and Minshall (1992, 1994) to be useful in distinguishing streams between ecoregions in Idaho. Nelson et al.

(1992) and Overton et al. (1993) also found widths and depths to be important variables in separating streams from different geologic regions and with different degrees of management, respectively.

Width and depth measurements should be made at each of the three riffle habitat units where macroinvertebrate samples were taken. Mark bankfull on both the left and right banks. String a tape from bankfull to bankfull and check for level. Record the horizontal distances from one of the bankfull points at a minimum of ten locations. At each of these locations, record the depths from the stream bottom to the horizontal tape. Two of these ten measurements must be made at the left and right wetted stream edges. Record tape-to-water-surface as well as tape-to-stream-bottom if the stream bank is vertical (both the bankfull and wetted edges would be at the same horizontal location in these cases). When a transect contains an undercut bank, measure and record the horizontal distance of the undercut.

When a width/depth transect is measured in a split channel, there are two ways to make the measurement. Bankfull measurements should be taken in the channel with the most flow if the area between the two channels is above the ordinary high water level. Bankfull measurements should be taken across both of the channels if the area between the channels is below the ordinary high water level.

Shade

Canopy cover is a surrogate for water temperature since vegetation controls the amount of sunlight reaching the stream (Platts et al. 1987). Canopy cover was found to be an important variable in studies by Mulvey et al. (1992) and Overton et al. (1993). Temperature and canopy cover helped explain differences in fish occurrence and abundance in these studies as well as in the Robinson and Minshall (1992, 1994) ecoregion studies.

Each BURP crew will use a densiometer to determine canopy cover. The number of densiometer grid intersections obstructed by overhead vegetation will be recorded. Densiometer readings will be taken at three riffle habitat units. Densiometer measurements should be taken on the riffle relative to where the macroinvertebrate samples were taken. For stream orders 1-4 the following four readings will be taken per cross section; right bank, left bank, from the center of the stream facing upstream, and from the center of the stream facing downstream.

Substrate

Substrate composition is a component of fish and macroinvertebrate habitat. The Wolman pebble count characterizes stream bottom substrates (Wolman 1954). A modified method referred to in this workplan as the "pebble count" will enable the DEQ to make quantitative measurements on percentages of fines, gravel, cobble, and boulder. Fine sediment and availability of living space have direct affect on both fish and insects (Marcus et al. 1990, Minshall 1984). Several studies and state projects have found relative substrate size to be important indicators of water quality effects due to activities in the watershed (Overton et al. 1993, McIntyre 1993, Skille 1991).

Pebble counts (substrate measurements) are to be conducted at the same three riffle habitat units where macroinvertebrates were sampled. The pebble count begins at the bankfull level on one stream bank and proceeds across the riffle to the bankfull level on the opposite stream bank. Pebbles should be selected at equal distant intervals (heel to toe, one pace, each foot on a tape, etc.). At each interval, the observer reaches to the stream bottom, picks up the first particle touched, and measures the intermediate axis. The particle should be replaced down stream of the transect line. The survey should be conducted with as little bottom disturbance as possible. A minimum of 150 particles measured from three riffles (50 per riffle) is required. Measurements should continue until the bankfull streambank is reached even if the 50 counts are reached before a transect is completed. Each successive pass should be upstream from the previous pass if multiple passes are required to reach the minimum 50 pebbles per riffle.

Habitat Types

The relative amount of each habitat type in a reach of stream is an indicator of the availability of habitat for fish (Reiman and McIntyre 1993). Spawning typically takes place at pool tailouts in the transition between pools and riffles. However, as fish grow, pools become more important as areas for rearing.

The length of each habitat type will be measured. Habitat types will be differentiated following Meehan (1991).

- **Riffle** - Shallow section of a stream with rapid current and a water surface broken by gravel, rubble, or boulders.

- **Run** - Swiftly flowing stream reach with little surface agitation and no major flow obstructions. A run often appears as a flooded riffle.

- **Glide** - Slow, relatively shallow stream section with water velocities of 10-20 cm/s (0.3-0.6 ft/s) and little or no surface turbulence.

- **Pool** - Portion of a steam with reduced water velocity, water depth greater than surrounding areas, water surface gradient at low flow often near zero and bed often concave in shape forming a depression in the profile of a stream's thalweg.

Pool Complexity

Pool complexity is a measure of pool quality and pool to riffle ratio is a measure of pool quantity. In a study of streams that differed by the amount of management in their watersheds, Overton et al. (1993) found pools in the less impacted watersheds were more frequent, had higher volumes, and greater depths than those in the more impacted watersheds. Beschta and Platts (1986) suggested the quality of pools is equally as important as the number of pools in describing a healthy stream from a fisheries standpoint.

Pool complexity will be measured at a minimum of three pools if pools are present at the site. Pool length, substrate, overhead cover, submerged cover, bank cover, maximum pool depth, maximum pool width, and depth at pool tailout will be measured.

Large Organic Debris

Large Organic Debris (LOD), sometimes referred to as "large woody debris", has been found important in smaller sized streams where the riparian zone is made up of evergreens, i.e., forested situations (Everest et al. 1987). Large organic debris has been found to be important for the complexity it adds to stream habitats, retention of allochtonous matter and sediment, and stability it imparts to streams under high flow conditions. Some species of salmonids show a high affinity for LOD (Rieman and McIntyre 1993).

All LOD greater than ten centimeters in diameter and one meter in length will be counted within each stream site. This parameter only applies to streams in forested situations. Occasionally, sites will be encountered with large accumulations of LOD. At these sites, it is acceptable to count up to 100 pieces than estimate thereafter, i.e., <100 pieces of LOD in site, count individually, >100 pieces in site, count by tens.

Photopoints

Photographic records of sites can be used to determine qualitative changes through time of riparian conditions and stream channel modifications.

Each crew will be supplied with slide film, dateback cameras, and compasses. Two photos will be taken of the stream site from the lower end of the site. One photo should be taken facing upstream and one facing downstream. The azimuth in which each photo is taken will also be recorded.

Macroinvertebrates

Macroinvertebrates are an essential part of the BURP process. The biological community of a stream reflects its overall ecological integrity. Because most streams are monitored infrequently, chemical monitoring is not always representative of the long term condition of the stream. Biological monitoring provides an integrated representation of water conditions and provides better classification of the stream's condition and support status because the biological community is exposed to the stream's condition over a long period of time,.

Macroinvertebrate samples will be collected from three separate riffle habitat units following Clark and Maret (1993). Each of the three samples will be preserved separately for laboratory compositing. The first 500 individuals will be counted and identified.

Fish

Fish are an integral part of the aquatic biological community. They give a long term indication of stream condition, represent the top trophic level in fresh water systems, are an economically significant resource in Idaho, and are the aquatic fauna most recognized by the general public. Qualitative fish data (one pass) will be used to assess the aquatic life beneficial use when the macroinvertebrate and fish habitat indices are not conclusive for water body status and to assess the salmonid spawning beneficial use. Quantitative fish data can also be used to assess both of these uses when it is available.

Prior to field collection the DEQ will consult with the Idaho Department of Fish and Game on historical stocking activities, and conduct a literature search for other fish data ≤5 years old. Acceptable data will be recorded on DEQ fish data sheets (same as electrofishing field forms), including site description information and collector(s) for entry into the DEQ database.

Core Methods

- The study site for fish should include all available habitat types present in the reach.
- Electrofish the study site. Electrofish after macroinvertebrates have been sampled and before habitat measurements are taken to minimize site disturbance.
- The survey should include one upstream pass without block nets as a minimum reconnaissance level (qualitative) effort.
- Collect and count all fish.
- Measure total length of each fish of the family Salmonidae collected. Salmonids occurring in Idaho include rainbow trout/steelhead, cutthroat trout, rainbow/cutthroat hybrids, brook trout, bull trout, brook/bull trout hybrids, brown trout, brook/brown trout hybrids (tiger trout), lake trout, brook/lake trout hybrids (splake), golden trout, kokanee/sockeye salmon, coho salmon, chinook salmon, lake whitefish, mountain whitefish, Bear Lake whitefish, pygmy whitefish, Bonneville whitefish, Bonneville cisco, Atlantic salmon and Arctic grayling. If hundreds of young-of-the-year are collected, a random subset of the total catch of each species may be measured for total length. All young-of-the-year should be counted.
- Voucher up to six (6) specimens of each species at each site as the fish collection permit allows. Voucher according to the addendum to the DEQ protocol #6 (Chandler et al. 1993). See Appendix IV.
- Record the amount of electrofishing effort (time) spent on the stream site. Record the effort (time) for each pass if multiple passes are made.
- Record the relative proportion of habitat types within the site on the fish data sheet if different from the habitat assessment.
- Estimate length and average width (minimum of five transect measurements) of the stream site electrofished.

Optional Methods

- Quantitative (closed population or mark-recapture) assessment using block nets and multiple passes.

- Record length and weight of all fishes (game and non-game).

Stream Channel Classification

Streams in Idaho exhibit considerable variability in climates, hydrology, geology, landforms, and soils. Recognizing this, the TAC elected to use Rosgen's (1994) Stream Classification System as a means of organizing and stratifying streams for comparison. As Conquest et al. (1993) noted, "One way to organize an inherently variable landscape is to employ a system of classification. The general intent of the classification is to arrange units into meaningful groups in order to simplify sampling procedures and management strategies." Additional descriptive items may be collected in the field and in the office before and after the assessment is made.

- Latitude
- Longitude
- Elevation
- Slope
- Stream Order
- Valley Type
- Aspect
- Lithology
- Rosgen Stream Type

Recommended Procedure Sequence For Site Evaluation

1. Pre-field step to gather all existing chemical, physical habitat, and biological data residing with other federal and state agencies or entities, with the aim of identifying potential sampling sites.

2. Determine the appropriate site to survey in the field. The minimum site length should be 20 times the wetted width or 100 meters, whichever is larger.

3. Measure the appropriate distance and mark beginning and ending points with flagging, being careful to stay out of stream. The downstream end of the measured length of stream is considered the beginning.

4. Take photographs of the site and record GPS coordinates, photopoint, and map location.

5. Fill out the descriptive cover sheet information, i.e., stream slope and Rosgen stream type, stream order, crew members' names, weather, location relative to some reference landmark, stream temperature (measured with a thermometer), general observations, etc.

6. Measure stream discharge by choosing a location with a relatively straight channel and uniform flow, where possible.

7. Locate the first riffle upstream from beginning point.

8. Randomly select a location for macroinvertebrate sampling following these steps:

   a. stretch a tape along one bank from the lower to the upper end of the riffle;

   b. generate a random number on the tape;

   c. stretch the tape across the riffle at this random location; and

   d. generate a random number and locate on "cross-riffle-tape" and place the sampler (Hess or Surber) at that location.

9. Take an invertebrate sample by stirring substrate and brushing rocks for a minimum of two minutes (strive for a consistent time of 3-5 minutes per sample). Place the sample into a container, label inside and out, and preserve with 70% ethanol (container should be ½ to ¾ full). If container is greater than 50% full of sample material, contents should be divided into two containers of fresh alcohol or rinsed with 70% ethanol three times within 24 hours.

10. Conduct fish sampling (electrofishing, et cetera) if it is to be done.

11. Conduct a pebble count immediately upstream from the macroinvertebrate sample transect. Pebble counts will be conducted from bankfull level on one side to the bankfull level on the opposite side of the stream. Proportion the counts so a minimum of 50 pebbles are measured from the entire channel cross section. This may mean conducting another pass above the first pebble count transect in small streams. This may be necessary to repeat several times on very narrow streams. Fifty pebbles might be counted before the transect is complete on wide streams. In these cases, the count should be continued to the bankfull level. Return pebbles to stream after measuring intermediate axes.

12. Take canopy closure (shade) measurements at the riffle habitat unit transect where macroinvertebrates were sampled. Measure at right and left bank and in the middle of stream facing upstream and another facing down stream.

13. Measure width and depth of the stream at the riffle habitat unit transect where macroinvertebrates were sampled. Mark bankfull on both the left and right banks. String a tape from bankfull to bankfull points, then check to see the tape is level. Record the horizontal distances from one of the bankfull points to a minimum of ten locations. Measure and record depths from the tape to the stream bottom at each location. Two of the measurements must occur at the left and right wetted edges.

14. Proceed to a mid-site riffle habitat unit and repeat procedures 8 through 13 above (exclusive of procedure 10).

15. Proceed to an upper-site riffle habitat unit and repeat procedures 8 through 13 again (exclusive of procedure 10).

16. Conduct habitat type measurements by measuring and characterizing as either pool, riffle, run, or glide. Express this on the field forms by percent of total length surveyed.

17. Assess pool complexity at a minimum of three pools within the site. Follow the pool definition described under "Habitat Types" in selecting pools.

18. Conduct a bank stability survey by rating each bank for the four different categories noted on the field forms; covered and stable, covered and unstable, uncovered and stable, and uncovered and unstable. Express ratings as percentages. Use the tape that was used for obtaining the riffle/pool measurement or use a two meter pole.

Quality Assurance

This section of the BURP Workplan outlines the elements of the quality assurance (QA) portion of this project and provides a clear delineation of QA responsibilities. The term "quality assurance" includes the quality control functions and involves a totally integrated program for ensuring the reliability of monitoring and measurement data.

Sampling Process

The BURP sampling process is composed of many different monitoring methods. The uncertainty of the final result from these methods is a function of the uncertainties of each individual method. There is potential for errors in all monitoring methods being used in the BURP process. The objectives of quality assurance for the sampling process of the project are:

- be able to identify, measure and control errors; and
- minimize errors and their cumulative effect.

The entire sequence of measurement, sample gathering, preservation, storage, and shipment must be evaluated to measure and minimize systematic and random error. The DEQ evaluates these considerations by conducting crew supervision, a training workshop, regional training, and field audits for each of the crews collecting data.

Crew Supervision

Each crew will be provided with supervision throughout the collecting season. The DEQ Regional BURP Coordinators must be available during the training period and accompany the crews at least one day a week during the collecting season.

BURP Coordinator Workshop

A coordinator workshop will be conducted prior to the sampling season . This workshop will provide the following:

- transfer of training materials and instructional methods;
- provide training on new methods; and
- coordinate statewide consistency for sampling methods.

The DEQ Central Office staff will coordinate and facilitate the workshop. Each DEQ Regional BURP Coordinator and Central Office BURP staff will be randomly assigned one or more parameters (see previous section "core parameters") to prepare for and present at the workshop. Preparation includes:

- a copy of the relative sections of referenced protocol;
- printed recomendations of training method; and
- an example of properly recorded measurements.

The materials prepared will be bound to create an annual reference document.

Time during the trainers' workshop will also be available to provide internal or external training on new or modified parameters. The 1996 trainers' workshop will focus on electrofishing methods.

Regional Crew Training

Following the trainer's workshop, DEQ Regional BURP Coordinators will conduct training of crews within their region. The regional crew training will cover all aspects of the BURP process whether training is a refresher for veteran crews or first time for new crews. Training will provide a chance for hands-on experience in each parameter for each BURP crew member. Regional crew training will require at least two days including a minimum of one-day classroom and one-day field experience.

Field Audits

A field audit consists of the DEQ Watershed Monitoring and Analysis Bureau staff, accompanied by the Regional Office BURP Coordinator, observing BURP crews performing measurements and collecting samples from a site. Audits are scheduled to occur within two weeks of crew training. Each crew will have at least one audit per season. During a field audit, the audit team will inspect a crew measuring, collecting, and preserving samples. The audit team, using predefined standards (Appendix V), will determine whether or not data generated from the audited monitoring effort is acceptable.

Unacceptable efforts will be rated as either **minor** or **major**; minor meaning the data can be corrected, major meaning a serious breech of protocol has occurred and the data has been compromised in some fashion. An example of minor may be a simple recording error, for instance recording 10 when 0.1 was the correct number. An example of major would be conducting a Wolman Pebble count in the wetted portion of the stream, not from bankfull to bankfull as per the protocol, or six macroinvertebrate samples with the same site identification number. Data labeled as major will be taken before the TAC to determine if it can or cannot be used.

A debriefing will be provided and a report prepared, by the DEQ Central Office staff immediately following the field audit. This report will be provided to the DEQ Regional Monitoring and Technical Support Supervisors, DEQ Regional BURP Coordinator, and the DEQ Watershed Monitoring and Analysis Bureau Chief.

For 1996, the DEQ is implementing a field audit of the electrofishing procedure. Crews will be observed while preparing and conducting electrofishing surveys, in addition to handling and vouchering fish specimens (Appendix V).

QA Data Handling Process

Data handling prior to the submittal to Central Office is considered part of the sampling process. Once received, the data enter the data handling process. Specifics of the QA for data handling can be found in *Procedures and Guidelines for QA/QC of 1995 Beneficial Use Reconnaissance Project (BURP) Data (DEQ, 1995)*, or most recent version. Generally, the QA process requires review of data sheets by the DEQ Central Office QA crew and data entry by the DEQ's Information Services Bureau.

Laboratory Process

Laboratory QA is addressed in the 'request for proposal' for macroinvertebrate and fish identification. You may contact Bob Chehey, Idaho Bureau of Laboratories, (208)334-2235, for more information.

Safety Training and Certification

All BURP crew members, Regional Coordinators, and Central Office Technical Team staff will be trained and certified in cardio-pulmonary resuscitation. This requirement will increase safety during electrofishing, training, and BURP field work. The BURP crews can be trained by the DEQ "in-house" or certification can be a hiring requirement. For safe handling of formalin see Appendix VI.

Data Analyses and Interpretation

This document describes how to conduct a survey following the BURP process. It merely lays out how a BURP survey is conducted; assumptions, methods, data handling, and equipment required. It is not intended to be or describe the analysis and interpretation of the data collected. Interpretation of BURP data and any other relevant water quality information, be it chemical, physical habitat, or biological is described in the DEQ's Water Body Assessment Guidance (WBAG) document. The WBAG document outlines the process the DEQ will use in determining: 1) existing beneficial uses; 2) beneficial use support status (full support, not full support); and 3) beneficial use attainability. The WBAG is referenced in the current water quality rule making package as an "Analytical Tool." The WBAG is currently being reviewed by a Technical Review Committee, consisting of scientists, for its technical merit. The DEQ intends to disseminate this document to a wider audience once this committee has completed its review. The DEQ plans on holding public workshops to assist in the understanding of the WBAG and the overall analysis and interpretation process.

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Glossary

abiotic - applied to the non-living, physical, and chemical components of an ecosystem, as distinct from the biotic or living components.

attainable use - a beneficial use that, with improvement, a waterbody could support in the future

beneficial use - any of the various uses that may be made of water, including, but not limited to, water supply (agricultural, domestic, or industrial), recreation in or on the water, aquatic biota, wildlife habitat, and aesthetics.

criteria - either a narrative or numerical statement of water quality on which to base judgement of suitability for beneficial use.

designated use - a beneficial use listed for a waterbody or waterbodies in a state's water quality regulations.

discharge - commonly referred to as flow, expressed as volume of fluid per unit time (e.g. cubic feet per second) passing a particular point, in a river or channel or from a pipe.

existing use - a beneficial use actually attained by a waterbody on or after November 28, 1975.

eutrophication - the process of nutrient enrichment in aquatic systems, such that the productivity of the system is no longer limited by the availability of nutrients. This is a natural process but may be accelerated by human activities.

integrity - the extent to which all parts or elements of a system (e.g. aquatic ecosystem) are present and functioning.

monitoring - to check or measure water quality (chemical, physical, or biological) for a specific purpose, such as attainment of beneficial uses.

nonpoint source - referring to pollution originating over a wide geographical area, not discharged from one specific location.

point source - any discernable, confined, or discrete conveyance of pollutant, such as a pipe, ditch, or conduit.

pollution - any alteration in the character or quality of the environment due to human activity that makes it unfit or less suited for beneficial uses.

reconnaissance - an exploratory or preliminary survey of an area.

reference conditions - conditions which fully support applicable beneficial uses, with little impact from human activity and representing the highest level of support attainable.

surface water - the collection of all natural bodies of water, including but not limited to streams, lakes, and wetlands, evident on the surface of the land.

waterbody - a specific body of water or geographically delimited portion thereof.

water quality - a term for the combined chemical, physical, and biological characteristics of water which affect its suitability for beneficial use.

wastewater - treated or untreated sewage, industrial waste, or agricultural waste and associated solids.

thalweg - a line joining the deepest points along successive cross-sections of a river channel.

Appendix I. Streams Proposed for Monitoring in 1996 by Region

Eastern Idaho Regional Office		
Stream Name	**PNRS #**	**Hydrologic Unit Code**
Withington Creek	1069	17060204
Baldy Creek		17060204
Muddy Creek		17060204
Hayden Creek	1079	17060204
Basin Creek	1080	17060204
Pack Creek	1060	17060204
Texas Creek	1092	17060204
Agency Creek	1076	17060204
Pattee Creek	1075	17060204
Corn Creek	1359	17060207
Horse Creek		17060207
Hughes Creek	991	17060203
Owl Creek	965	17060203
North Fork Salmon River	990	17060203
Dahlonega Creek	992	17060203
Fourth of July Creek	993	17060203
Cow Creek	1005	17060203
Hat Creek	1004	17060203
Iron Creek	1002	17060203
Williams Creek	998	17060203
Moyers Creek	978	17060203
Arnett Creek		17060203
Morgan Creek	1101	17060202
Burnt Creek	1114	17060202

Stream Name	PNRS #	Hydrologic Unit Code
Herd Creek	1023	17060201
East Fork Salmon River	1022	17060201
Germania Creek	1028	17060201
Hell Roaring Creek	1049	17060201
Basin Creek	1038	17060201
Kinnikinic Creek		17060201
Bayhorse Creek	1020	17060201
West Fork Morgan Creek		17060201
Cherry Creek	169	17040218
Corral Creek	186	17040218
Lake Creek	184	17040218
Fall Creek	182	17040218
Kane Creek	178	17040218
Pass Creek	171	17040218
Thousand Springs Creek	175	17040218
Sage Creek		17040218
Fox Creek	182	17040218
Iron Bogg Creek	170	17040218
Cabin Creek	187	17040218
Hurst Creek	141	17040217
Little Lost River	140.1	17040217
Big Springs Creek	142	17040217
Pass Creek	157	17040216
Willow Creek	158	17040216
Fritz Creek	212	17040215
Irving Creek	211	17040215
Edie Creek	210	17040215
Indian Creek	207	17040215

Stream Name	PNRS #	Hydrologic Unit Code
Middle Creek		17040215
Divide Creek	214	17040215
Webber Creek	209	17040215
Crooked Creek	216	17040215
East Camas Creek	191	17040214
West Camas Creek	201	17040214
Larkspur Creek	202	17040214
China Creek	200	17040214
Spring Creek	199	17040214
Tex Creek	8	17040205
Meadow Creek	1	17040205
Birch Creek	6	17040205
Williams Creek	7.1	17040205
Mill Creek		17040205
Blacktail Creek		17040205
Gravel Creek		17040205
Patterson Creek		17040204
Mahogany Creek	131	17040204
Milk Creek		17040204
Canyon Creek	121	17040204
Warm Creek		17040204
Calamity Creek		17040204
Crooked Creek		17040204
Conant Creek	66	17040203
Sand Creek	69	17040203
Pine Creek		17040203
Squirrel Creek	67	17040203
Elk Creek	95	17040202

Stream Name	PNRS #	Hydrologic Unit Code
Hotel Creek	102	17040202
Partridge Creek	91	17040202
Yale Creek	103	17040202
Fish Creek	85	17040202
Robinson Creek	84	17040202
Rock Creek	87	17040202
Porcupine Creek	86	17040202
Pine Creek	9	17040104
Rainey Creek	12	17040104
Big Elk Creek	17	17040104
Palisades Creek	14	17040104
Bear Creek	15	17040104
Fall Creek	11	17040104
Pritchard Creek	10	17040104
Indian Creek	18	17040104
Sheep Creek		17040104
North Central Idaho Regional Office		
Big Cr	1128	
Big Sand Cr	1132	
Blakes Fork		17060108
Bonami Cr		17060108
Cow Cr	1136	
Deep Cr	1122	
Dry Fork Cr		17060108
EF Meadow Cr		17060108
Flannigan Cr	1123	
Flat Cr	1127	
Gold Cr	1125	
Hatter Cr	1126	

Stream Name	PNRS #	Hydrologic Unit Code
Jerome Cr		17060108
Little Sand Cr	1131	
Mannering Cr		17060108
Meadow Cr	1129	
Palouse River	1120	
Palouse River	1121	
Rock Cr	1124	
SF Palouse River	1134	
Strychnine Cr	1130	
Wepah Cr		17060108
Corral Cr		17060306
EF Big Bear Cr		17060306
Feather Cr		17060306
Moose Cr		17060306
Porcupine Cr	1159	
Browns Spring Cr		17060306
Clear Cr		17060304
Lodge Cr	1281	
Pine Knob Cr		17060304
Solo Cr		17060304
Boyd Cr		17060302
Elk City Cr		17060302
Falls Cr		17060302
Glover Cr		17060302
Goddard Cr		17060302
Hamby Fork Cr		17060302
Island Cr		17060302
Nineteenmile Cr		17060302
Slide Cr		17060302
Twentythreemile Cr		17060302

Stream Name	PNRS #	Hydrologic Unit Code
Rackliff Cr		17060302
Wart Cr		17060302
American River	1303	
Big Elk Cr	1304	
Buffalo Gulch Cr		17060305
Crooked River	1302	
Kirks Fork		17060305
Lick Cr		17060305
Lightening Cr		17060305
Little Elk Cr	1304.1	
Red Horse Cr		17060305
Sears Cr		17060305
Big Cr	877	17060210
Cook Cr		17060210
Elk Cr	869	17060210
Indian Cr		17060210
Little Salmon River	863	17060210
Little Salmon River	864	17060210
Porter Cr		17060210
Shingle Cr		17060210
Squaw	865	17060210
Little Boulder Cr		17060209
Upper Big Cr		17060207
Allison Cr		17060209
Big Cr		17060207
Big Mallard		17060207
China Cr		17060209
Cottonwood Cr	1324	17060209
Cow Cr		17060209
Deep Cr	1326	

Stream Name	PNRS #	Hydrologic Unit Code
Deer Cr	1323	17060209
Deer Cr	1331	17060209
Grave Cr	1329	17060209
Jersey Cr		17060207
Jungle Cr		17060209
Kessler Cr		17060209
Little Mallard Cr		17060207
Little Slate Cr	1334	17060209
Little Whitebird Cr		17060209
Maloney Cr	1325	
Race Cr	1336	17060209
Rhett Cr		17060207
Rice Cr	1327	
Rock Cr	1328	
Salmon River	1346	
Skookumchuck Cr		17060209
Slate Cr	1333	17060209
Turnbull Cr		17060209
Upper Crooked Cr		17060207
Van Buren		17060209
Warren Cr	1352	
Deep Cr	912	
Divide Cr	905	17060101
Getta Cr	907	17060101
Wolf Cr	906	17060101
Northern Idaho Regional Office		
Boundary Creek	1389	17010104
Wall Creek		17010105
Priest River Lower W	1411	17010215

Stream Name	PNRS #	Hydrologic Unit Code
Grouse Creek NF	1455	17010214
Hoodoo Creek	1441	17010214
Wellington Creek	1477	17010213
Adair Creek		17010304
Baldy Creek	1535.~~01~~	
Beaver Creek	1499	17010301
Benewah Creek	1578	17010303
Bird Creek		
Black Lake	1529.5	
Blackjack Creek	1575.04	
Bluff Creek		
Bond Creek	1598	
Bruin Creek	1620	17010304
Bumblebee Creek	1486	
Burnt Cabin Creek	1492	17010301
Calamity Creek		17010301
Carlin Creek	1538	
Carpenter Creek		17010304
Cedar Creek	1542	17010303
Cinnamon Creek		17010301
Coeur d'Alene River NF	1485	
Copper Creek	1487	
Cougar Creek	1500.02	
Cub Creek		17010301
Daveggio Creek	1604.01	17010304
Downey Creek	1505	17010301
Eagle Creek	1501	
Eagle Creek		

Stream Name	PNRS #	Hydrologic Unit Code
Elk Creek, Big	1511	
Falls Creek	1504.01	
Fernan Creek	1544	
Flat Creek	1507	17010301
Flewsie Creek	1596.01	
Fourth of July Creek	1534	
Gramps Creek	1598.02	
Harvey Creek	1575.03	
Hugus Creek	1600	
Idaho Creek	1500.05	
Kid Creek	1546	
Lake Creek	1549	17010303
Larch Creek	1535.02	
Latour Creek	1535	17010303
Laverne Creek	1488	
Leiberg Creek	1489	17010301
Lost Fork Creek		17010301
Norton Creek	1605.03	17010304
Ophix Creek	1500.04	
Prichard Creek		17010301
Prichard Creek	1500	17010301
Prichard Creek		17010301
Prospector Creek	1615	
Quartz Creek	1618	17010304
Rutledge Creek		17010304
Shoshone Creek		17010304
Steamboat Creek	1490	
Steamboat Creek	1495	

Stream Name	PNRS #	Hydrologic Unit Code
St. Maries River	1579	17010304
St. Maries River	1581	17010304
St. Maries River		
Tank Creek	1575.02	
Teepee Creek	1508	17010301
Terror Gulch		
Thompson Creek	1530	
Tiger Creek	1500.01	17010301
Trail Creek	1510	
Turner Creek	1539	
Wesp Creek	1500.03	
Willow Creek	1531	
Yellowdog Creek	1506	17010301
South Central Idaho Regional Office		
Fall Creek	364	17040209
Rock Creek E. F.	366	17040209
Raft River	430	17040210
Raft River	431	17040210
Sublett Creek	432	17040210
Sublett Creek	433	17040210
Sublett Creek	435	17040210
Lake Fork Creek	436	17040210
Fall Creek	437	17040210
Conner Creek	439	17040210
Cottonwood Creek	440	17040210
Clear Creek	441	17040210
Edwards Creek	442	17040210
Goose Creek	445	17040211

Stream Name	PNRS #	Hydrologic Unit Code
Goose Creek	447	17040211
Trapper Creek	449	17040211
Fall Creek	450	17040211
Cottonwood Creek Big	451	17040211
Cottonwood Creek Big	452	17040211
Summit Creek	453	17040211
Mill Creek	454	17040211
Spring Creek	455	17040211
Clover Creek	381	17040212
Bancroft Springs	382	17040212
White Springs L	383	17040212
Sand Springs Creek	387	17040212
Blind Canyon Creek	389	17040212
Briggs Spring Creek	391	17040212
Deep Creek	392	17040212
Deep Creek	393	17040212
Mud Creek	394	17040212
Cedar Draw Creek	397	17040212
Cottonwood Creek	403	17040212
Devil Corral Creek	406	17040212
Dry Creek	409	17040212
Dry Creek E F	410	17040212
Dry Creek W F	411	17040212
Salmon Falls Creek	460	17040213
Devil Creek	461	17040213
Cedar Creek	462	17040213
Shoshone Creek	466	17040213
Shoshone Creek	467	17040213

Stream Name	PNRS #	Hydrologic Unit Code
Shoshone Creek	468	17040213
Big Creek	470	17040213
Cottonwood Creek	471	17040213
Hot Creek	472	17040213
Big Wood River	475	17040219
Big Wood River	476	17040219
Big Wood River	477	17040219
Big Wood River	478	17040219
Big Wood River	479	17040219
Big Wood River	481	17040219
Big Wood River	482	17040219
Dry Creek	484	17040219
Thorn Creek	485	17040219
Richfield Canal	486	17040219
Willow Creek	488	17040219
Slaughterhouse Creek	490	17040219
Croy Creek	491	17040219
Quigley Creek	492	17040219
Indian Creek	493	17040219
Deer Creek	494	17040219
Greenhorn Gulch Creek	495	17040219
Wood River E F	496	17040219
Hyndman Creek	498	17040219
Trail Creek	499	17040219
Warm Springs Creek	501	17040219
Lake Creek	502	17040219
Fox Creek	503	17040219
Big Wood River N F	505	17040219

Stream Name	PNRS #	Hydrologic Unit Code
Prairie Creek	508	17040219
Camp Creek	533	17040220
Willow Creek	534	17040220
Elk Creek	535	17040220
Deer Creek	536	17040220
Soldier Creek	537	17040220
Threemile Creek	540	17040220
Threemile Creek	541	17040220
Corral Creek	542	17040220
Corral Creek	543	17040220
Chimney Creek	544	17040220
Cow Creek	545	17040220
Wildhorse Creek	546	17040220
Little Wood Creek	511	17040221
Little Wood Creek	513	17040221
Little Wood Creek	514	17040221
Little Wood Creek	516	17040221
Silver Creek	517	17040221
Silver Creek	518	17040221
Loving Creek	519	17040221
Stalker Creek	520	17040221
Grove Creek	520	17040221
Fish Creek	524	17040221
Muldoon Creek	525	17040221
Friedman Creek	526	17040221
Copper Creek	527	17040221
Baugh Creek	528	17050113
Skeleton Creek	595	17050113

Stream Name	PNRS #	Hydrologic Unit Code
Boardman Creek	596	17050113
Big Smokey Creek	597	17050113
Big Smokey Creek	598	17050113
Paradise Creek	599	17050113
Big Smokey Creek W F	600	17050113
Op Creek	602	17050113
Skunk Creek	603	17050113
Bear Creek	604	17050113
Emma Creek	605	17050113
Johnson Creek	606	17050113
Vienna Creek	607	17050113
Ross Fork Creek	608	17050113
Southeast Idaho Regional Office		
Portneuf River*	328	
Fish Creek		
Jackson Creek		
Indian Creek		
City Creek		
Trail Creek		
Jeff Cabin Creek		
Bannock Creek*	349	
W. Fork Bannock Creek*	349.01	
Moonshine Creek*	349.02	
Rattlesnake Creek*	350	
Rock Creek*	365	
E. Fork Rock Creek*	366	
Knox Creek		
Midnight Creek		

Stream Name	PNRS #	Hydrologic Unit Code
Deep Creek	297	
Fall Creek		
McTucker Creek*	356	
Tincup Creek	221	
Squaw Creek		
Jackknife Creek	220	
Stump Creek	222	
Gravel Creek		
Tygee Creek		
Crow Creek	225	
Haderlie Creek		
S. Fork Sage Creek		
Bear Creek		
Brush Creek		
Miner Creek		
Horse Creek		
Grizzly		
Strawberry Creek		
Carter Creek		
Five-Mile Creek		
Worm Creek		
Swan Lake Creek		
Ovid Creek*	261	
East Branch Creek		
Trail Creek		
Johnson Creek		
Alder Creek		
Little Creek*	269	

Stream Name	PNRS #	Hydrologic Unit Code
Samaria Creek*	289	
Cherry Creek	339	
Deep Creek	286, 287, 288	
Southwest Idaho Regional Office		
Alkali Creek (HW to Snake River)	423.00	17050101
Bannock Creek (HW to Mores Creek)	-	17050112
Basin Creek (HW to Deadwood Res.)	-	17050120
Big Flat Creek (NV line to EF Bruneau)	559.00	17050102
Big Pine Creek (HW to SF Payette)	712.00	17050120
Big Willow Creek (HW to Payette) **	694.00	17050122
Blacks Creek (HW to Blacks Cr. Res.)	737.00	17050114
Boise River (Notus to Snake River)	726.00	17050114
Boise River (Star to Notus)	727.00	17050114
Boise River (Barber Diversion to Star)	728.00	17050114
Boise River (Lucky Peak to Barber Div.)	729.00	17050114
Browns Creek (HW to Pickett Creek)	682.00	17050103
Castle Creek (HW to Deep Creek)	616.00	17050104
Castle Creek (T5SR1ES27 to Snake)	680.00	17050103
Castle Creek , SF (HW to Castle Creek)	683.00	17050103
Cayuse Creek (BNF to SF Boise River)	-	17050113
Cherry Creek (NV line to EF Bruneau)	560.00	17050102
Clear Creek #1 (HW to Grimes Creek)	-	17050112
Clear Creek #3 (HW to Grimes Creek)	-	17050112
Corral Creek (HW to Cabin Creek)	641.02	17050107
Cove Creek (HW to Weiser River)	839.00	17050124
Cow Creek (HW to Oregon line)	661.01	17050108
Crane Creek (Crane Cr. Res. to Weiser Riv)	840.00	17050124
Deadwood Creek (HW to EF Bruneau)	562.00	17050102
Deep Creek (HW to Owyhee River) **	614.00	17050104

Stream Name	PNRS #	Hydrologic Unit Code
Dennett Creek (HW to Snake River)	825.00	17050201
Divide Creek (HW to Snake River)	905.00	17060101
Eightmile Creek (HW to SF Payette)	-	17050120
Elk Creek (HW to Feather River)	-	17050113
Fivemile Creek (HW to Boise River)	734.00	17050114
Flint Creek (HW to Jordan Creek)	659.00	17050108
Getta Creek (HW to Snake River)	907.00	17060101
Granite Creek (HW to Mores Creek)	-	17050112
Grouse Creek (HW to SF Boise River)	-	17050113
Harris Creek (HW to Shafer Creek)	-	17050122
Indian Creek (NY Canal to Boise River)	731.00	17050114
James Creek (HW to MF Boise River)	-	17050111
Lightning Creek (HW to MF Payette)	-	17050121
Lime Creek (HW to Anderson Ranch) **	588.00	17050113
Louisa Creek (HW to Triangle Res.)	656.01	17050108
Louse Creek (HW to Jordan Creek)	660.00	17050108
Macks Creek (HW to Grimes Creek)	-	17050112
Mason Creek (HW to Boise River)	733.00	17050114
McBride Creek (HW to Oregon line)	672.00	17050103
Meadow Creek (HW to Fall Creek)	-	17050113
Meadow Creek (HW to Rock Creek)	657.00	17050108
Mores Creek (HW to Lucky Peak Res.)	743.00	17050112
Mud Creek (HW to Cascade Res.) **	898.00	17050123
Ninemile Creek (HW to Deadwood)	-	17050120
Noon Creek (HW to NF Owyhee River)	646.00	17050107
Phifer Creek (HW to MF Boise River)	-	17050111
Pickett Creek (T4SR1WS32)	681.00	17050103
Pleasant Valley Creek (HW to NF)	645.00	17050107
Poison Creek (HW to Jarbidge River)	568.00	17050102
Roaring River (HW to MF Boise	-	17050111

Stream Name	PNRS #	Hydrologic Unit Code
Robie Creek (HW to Mores Creek)	696.00	17050112
Rock Creek (HW to SF Boise River)	-	17050113
Ryegrass Creek (HW to Coldsprings Cr.)	422.00	17050101
Rock Creek (Triangle Res. to Big Boulder)	654.00	17050108
Sand Hollow Creek (HW to Snake River)	730.00	17050114
Scott Creek (HW to Deadwood River)	-	17050120
Shafer Creek (HW to Cottonwood Creek)	-	17050123
Chiefly Creek (HW to Blue Creek)	630.00	17050104
Sinker Creek (HW to Highway bridge)	679.00	17050103
Smith Creek (HW to SF Boise River)	578.00	17050113
Soda Creek (HW to Cow Creek)	662.00	17050108
Soldier Creek (HW to Little Squaw Creek)	697.00	17050122
Swanholm Creek (HW to MF Boise River)	-	17050111
Tenmile Creek (HW to Fifteenmile Creek)	-	17050114
Three Creek (HW to EF Bruneau River)	561.00	17050102
Twentymile Creek (HW to NF Payette) **	900.00	17050123
Upper Browns Creek (HW to MF Boise)	-	17050111
Upper Squaw Creek (HW to BNF Boun.)	-	17050122
Warm Springs Creek (HW to Snake)	828.00	17050201
Weiser R. Little (Indian Valley to Weiser)	845.00	17050124
West Fork Pine Creek (HW to Pine Cr.)	848.00	17050124
Whitehawk Creek (HW to Deadwood)	-	17050120
Williams Creek (HW to Jordan Creek)	650.00	17050108
Wilson Creek (HW to Deadwood Res.)	-	17050120
Wolf Creek (HW to Snake River)	906.00	17060101
Wood Creek (HW to Willow Creek)	576.00	17050113

** Trend Stream

Appendix II. Field Equipment Check List

EQUIPMENT DESCRIPTION	YES	NO
MACROINVERTEBRATE SAMPLE EQUIPMENT:		
Hess and Surber Sampler (500 µm mesh w/300 ml bucket)		
White pans		
Kick nets		
Macro sample containers		
Preservative (70% ethanol)		
Spare nets for Samplers		
Scrub brush		
Wash (squirt) bottles for rinsing (water and alcohol)		
Field labels		
Field Data forms		
Rubber gloves		
Forceps		
Pencils/Indelible alcohol proof markers		
ELECTROFISHING EQUIPMENT:		
Electrofisher		
Anode and Cathode		
Dip nets		
Waders		
Rubber gloves (shoulder length)		
Specific Conductivity Meter		
Preservative: 10% buffered formalin solution		
Scales (weight (springs) & length)		
Thermometer		
Collecting Permit or IDFG personnel		
Anesthetic		
Buckets		
Gas/oil		

EQUIPMENT DESCRIPTION	YES	NO
Generator (if using a battery powered electrofisher) + spare parts		
Specimen vouchering containers		
Fish measuring board		
Fish identification keys		
Clipboard/notebook/fish labels		
Field data sheets		
First Aid Kit		
Polarized sunglasses		
Fire extinguisher		
CPR Certification		
WOLMAN PEBBLE COUNT EQUIPMENT:		
Metric ruler (clear plastic) or angled measuring device listed in Protocol #2		
Shoulder length gloves		
Pencils/pens		
Field data sheets		
FLOW MEASUREMENT EQUIPMENT:		
Current velocity meter		
Top-setting-wading rod		
100 ft. measuring tape (minimum length)		
Rebar stakes		
Flow sheets		
Pencils/clipboard		
Waders		
Extra batteries for current meter		
MISCELLANEOUS EQUIPMENT:		
Densiometer		
2 meter rod		
Polarized sunglasses		
Tape measures		

EQUIPMENT DESCRIPTION	YES	NO
Random number table		
Field notebook/clipboards		
Maps		
"All" forms and labels		
Sunscreen		
Camera & film		
Extra batteries		
Emergency equipment for vehicle		
First aid kit		
GPS receiver		
Current Beneficial Use Reconnaissance Project Workplan		
DEQ/Other Protocols		
Tool Kit		
Pens/pencils		

Appendix III. 1996 Beneficial Use Reconnaissance Project Field Forms

1996 Beneficial Use Reconnaissance Project Field Forms, Idaho Division of Environmental Quality

Identification

Stream Name: ____________________ Site ID Nº: ____________

EPA River Reach Nº: ID- ____________ PNRS Nº: ____________ STORET: ____________

Location

Latitude: ____°____'____.____" Longitude: ____°____'____.____" Datum: ☐ NAD83 ☐ NAD27 ☐ Other: ____________

Pub LS Grid: ____¼,____¼,____¼ of Section ____, Township ____ ____, Range ____ ____ County: ____________

Ecoregion (Omernik, '86): ____________ Stream Order: ____________

GPS file name: ________.____ Lat/Long Confidence: ☐ 2-5 meters (corrected) ☐ 100 meters (raw) ☐ 500 meters (estimate)

Location Relative to Landmark: ____________

Elevation (from map): ________ (F=Ft., M=meters) Elevation (from GPS): ________ (F=Ft., M=meters) FIPS: ________

Collection

Date of Measurement (YY/MM/DD): ____/____/____ Weather Conditions: ____________

Crew Members: ____________

Description

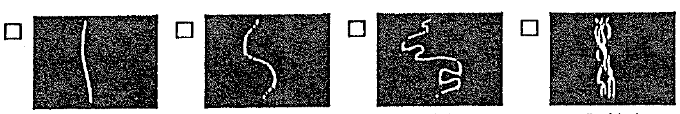
General Wetted Width of Stream: ☐ < 5 m ☐ > 5 m Total Reach Length: ________ m Rosgen Stream Type: ________

Gradient: ____.____% Human Activities Affecting Reach: ☐Forestry ☐Grazing ☐Mining ☐Roads ☐Agriculture ☐Recreation ☐Urban ☐Wilderness ☐Beaver Complex ☐Diversion ☐Other

Valley Type: ☐ ☐ ☐ ☐ ☐

U-Shape V-Shape Trough-Like Flat Bottom Box Canyon

Sinuosity: ☐ ☐ ☐ ☐



Low Moderate High Braided

Additional Information:
(Indicate riparian status and composition. If amphibians are present, indicate here and voucher)

Stream Name: ____________________ Site ID Nº: ____________ Date: ____/____/____

DISCHARGE MEASUREMENT NOTES

Dist. From Initial Point	Width (Ft.)	Depth (Ft.)	Obs. Depth (%)	Revs.	Time (Sec.)	VELOCITY (Ft./Sec.)		Area (Ft.^{2})	Discharge (Ft.^{3}/Sec.)
						Point	Mean		
								total	

Adapted from DEQ Discharge Measurement Notes

Macroinvertebrate

Were samples taken at this site during the low/stable flow period ?
(usually July 1 - October 15) ☐yes ☐no

First sample (place in separate container)

Label: ______________________________

Type of Sampler: ☐Hess ☐Surber ☐Kick ☐Other

Habitat: ☐Riffle ☐Pool ☐Run ☐Glide

Second Sample (place in seperate container)

Label: ______________________________

Type of Sampler: ☐Hess ☐Surber ☐Kick ☐Other

Habitat: ☐Riffle ☐Pool ☐Run ☐Glide

Third Sample (place in seperate container)

Label: ______________________________

Type of Sampler: ☐Hess ☐Surber ☐Kick ☐Other

Habitat: ☐Riffle ☐Pool ☐Run ☐Glide

☐ fill out "Macroinvertebrate Data Sheet" for laboratory use

Stream Name: ______________________________ Site ID Nº: ______________ Date: ____/____/____

1996 Beneficial Use Reconnaissance Project Field Forms, Idaho Division of Environmental Quality

Wolman Pebble Count

particle size	trans./riffle 1	trans./riffle 2	trans./riffle 3
silt/clay (0 - 1 mm)			
sand (1.1- 2.5 mm)			
very fine pebble (2.51 - 6 mm)			
pebble (6.1 - 15 mm)			
coarse pebble (15.1 - 31 mm)			
very coarse pebble (31.1 - 64 mm)			
small cobble (64.1 - 128 mm)			
large cobble (128.1 - 256 mm)			
small boulder (256.1 - 512 mm)			
medium boulder (512.1 - 1024 mm)			
large boulder (1024.1 & > mm)			

circle total for each count

Canopy Closure

PARAMETER		riffle 1	riffle 2	riffle 3
Canopy Density †*Right Bank*				
Canopy Density Center	*Up*			
	Down			
Canopy Density †*Left Bank*				

Canopy Density and/or Thermal Cover Field Form Adapted from DEQ Protocol #8.

† right bank (RB) or left bank (LB) facing upstream

Stream Name: ____________________ Site ID Nº:____________________ Date: ___/___/___

1996 Beneficial Use Reconnaissance Project Field Forms, Idaho Division of Environmental Quality

Longitudinal Habitat Distribution			
Pool (meters)	Glide (meters)	Riffle (meters)	Run (meters)
total Pool	total Glide	total Riffle	total Run

Streambank Condition							
Percent of Reach (%)							
Left Bank (looking upstream)				Right Bank (looking upstream)			
Covered Stable	Covered Unstable	Uncovered Stable	Uncovered Unstable	Covered Stable	Covered Unstable	Uncovered Stable	Uncovered Unstable

Streambank Field Form Adapted from DEQ Protocol #8.

Habitat Assessment Summary Sheet					
Habitat Parameter Riffle/Run Prevalence ☐	Optimal	Sub-Optimal	Marginal	Poor	Habitat Parameter Glide/Pool Prev. ☐
1. bottom substrate - % fines					1. pool substrate char.
2. instream cover					2. instream cover (fish)
3. embeddedness (riffle)					3. pool variability
4. velocity/depth					4. canopy cover
5. channel shape					5. channel shape
6. pool/riffle ratio					6. channel sinuosity
7. width to depth ratio (wetted)					7. width to depth ratio
8. bank vegetation protection					8. bank vegetation protection
9. lower bank stability					9. lower bank stability
10. disruptive pressures					10. disruptive pressure
11. zone of influence					11. zone of influence
column totals:					total score:

shaded cells indicate parameters to be generated from measurements. DO NOT FILL IN SHADED PARAMETERS

LOD SURVEY
Total number of pieces ≥10 cm diameter and ≥1m in length :

Stream Name: ______________________ Site ID Nº:______________________ Date: ___/___/___

Width/Depth Ratio

Station #

Cross Section Depths (Bankfull)

Left Wetted Edge (LWE) and Right Wetted Edge (RWE)

Depth in meters

riffle 1	depth				LWE							
	dist.											
									RWE			
riffle 2	depth				LWE							
	dist.											
									RWE			
riffle 3	depth				LWE							
	dist.											
									RWE			

Left bank determined by facing upstream

Stream Name: ____________________ Site ID Nº: ____________________ Date: ___/___/___

1996 Beneficial Use Reconnaissance Project Field Forms, Idaho Division of Environmental Quality

Photo Information:

Roll ____

Photopoint: Latitude and Longitude if different from previous GPS station

Photo #:______ Caption: ____ Azimuth:__________ °

(Optional) Latitude:______ °______ '______ .______ " Longitude:______ °______ '______ .______ "

Photo #:______ Caption: ____ Azimuth: __________ °

(Optional) Latitude:______ °______ '______ .______ " Longitude:______ °______ '______ .______ "

Photo #:______ Caption: ____ Azimuth: __________ °

(Optional) Latitude:______ °______ '______ .______ " Longitude:______ °______ '______ .______ "

Other:

Photo #: ______ Caption: ____

Photo #: ______ Caption: ____

Photo #: ______ Caption: ____

Photo #: ______ Caption: ____

Stream Name: ______________________ Site ID Nº:______________________ Date: ___/___/___

POOL QUALITY INDEX FIELD FORM						
Pool Quality Parameter		Pool Number 1	2	3	4	code explanation
maximum depth	measure (m)					N/A
pool tail out (depth)	measure (m)					N/A
residual depth	(max depth - pool tailout depth)					< 0.15m, code = 0 between 0.15m and 0.45m, code = 1 > 0.46m, code = 2
	code					
x̄ substrate	measure (mm)					gravel size material (< 63.5mm), code = 0 cobble size material (63.5 - 254mm), code = 1 boulder size material (> 254mm), code = 2
	code					
overhead	measure (%)					< 10 percent of the pool surface, code = 0 10 - 25 percent of the surface area, code = 1 > 25 percent of the surface area, code = 2
	code					
banks	measure (%)					< 25 precent of the band length, code = 0 25 - 50 percent of the bank length, code = 1 > 50 percent of the bank length, code = 2
	code					
submerged	measure (%)					< 10 percent of the pool surface, code = 0 10 - 25 percent of the surface area, code = 1 > 25 percent of the surface area, code = 2
	code					
pool length	measure (m)					N/A
maximum pool width	measure (m)					N/A

Stream Name: ______________________ Site ID Nº: ____________________ Date: ___/___/___

Division of Environmental Quality Macroinvertebrate Data Sheet

Field Information - Shaded areas must be completed before submittal of sample

DEQ Project Code	- - -		
Name of Water Body		Site ID Nº:	
Location Description: permanent Landmarks			

Station or subsample Nº:	County:	Township	Range:	Section:	Quarter:

Elevation:	Collector(s) First (or initial) & Last Names(s):	Sample Method:

Collection date (YY/MM/DD)	Collection Time:	Latitude/Longitude

Sampled Grids/Total	Habitat Sampled	Flow Conditions	Report Results to:
Sample Effort (min)	Sample Area (m²)	Analysis Requested	
		100/300/500/ALL	

Identifying Lab Information:

Lab Name:	Date Into Lab:	Date Reported	IDHW Central Lab Log Nº:
Taxonomist:		Remarks:	
Sorter(s) First (or initial) & Last name(s)		Total Nº Grids	Nº Grids Picked / Est. Nº Macros

Taxon	Taxon Code	Total No.	ID conf	Taxon	Taxon Code	Total No.	ID conf
Diptera				Trichoptera			

Division of Environmental Quality Macroinvertebrate Data Sheet

me of Waterbody: | Site Id Nº :

xon	Taxon Code	Total No.	ID conf	Taxon	Taxon Code	Total No.	ID conf
coptera				Hirudinea			
				Turbellaria			
				Gastropoda			
hemeroptera							
				Crustacea			
				Other			
oleoptera							

Division of Environmental Quality Fish Data Sheet

Field Information - Shaded areas must be completed before submittal of sample

DEQ Project Code: __ __ - __ __ __ __ __ __ __ __ - __ __ __ - __ __ __ __

Name of Water Body		Site ID Nº:
Location Description: permanent Landmarks		

Station or subsample Nº:	County:	Township	Range:	Section:	Quarter:

Elevation:	Collector(s) First (or initial) & Last Names(s):	Sample Method:

Collection date (YY/MM/DD)	Reach Length:	Avg. Reach Width:

Field Taxonomist:	Temperature:	Conductivity:

Identifying Lab Information:

Lab Name:	Date Into Lab:	Date Reported:
Taxonomist (First Initial & Last Name):		Remarks:

Taxa Vouchered:

Anomalies Noted:

Equipment Settings:

Species Stocked in last 5 years (note year)

Field Comments:

Stream Name: ______________________ Site ID Nº: ______________________ Date: ___/___/___

1996 Beneficial Use Reconnaissance Project Field Forms, Idaho Division of Environmental Quality

Fish Collection Data Form (reconnaissance)

reach length (m):	avg. reach width (m):	method: ☐ visual, ☐ snorkel, ☐ electrofish (☐AC ☐DC)
conductivity (µS/cm):	water clarity: turbid, clear, stained	effort(s):

species code*	species	total length (mm)	voucher (y/n)	total count	identification conf.**	anomalies ***	# of juveniles

Fish Collection Data Form Adapted from DEQ Protocol #6. * see 1996 training manual for updated codes** Fish confidence Codes: **A** (99.9%) - Must have fisheries taxonomist on collection crew or entire sample preserved and taxa work done by fisheries taxonomist (no visual estimate), **B** (99%) - Must have an experienced fisheries biologist on collection crew, or only part of sample preserved, **C** (90%) - Crew made up of individuals familiar with species, **D** (<90%) - No confidence or confidence unknown. *** Anomalies include parasites, deformities, frayed fins, etc.

Stream Name: ______________________ Site ID Nº: ______________ Date: ____/____/____

DEQ Fish Collection Record (Pass____of____, effort __________seconds)

Total Length (mm)	Taxa Code/ID Confidence					
10-19						
20-29						
30-39						
40-49						
50-59						
60-69						
70-79						
80-89						
90-99						
100-109						
110-119						
120-129						
130-139						
140-149						
150-159						
160-169						
170-179						
180-189						
190-199						
200-209						
210-219						
220-229						
230-239						
240-249						
250-259						
260-269						
270-279						
280-289						
290-299						
≥300 mm						

Stream Name: ______________________ Site ID №: ______________________ Date: ___/___/___

Appendix IV. Vouchering Addendum IDEQ Protocol #6

Fish Vouchering Procedures

Vouchering Purpose:

Vouchering of fish specimens is a quality assurance procedure at DEQ and is a routine step in "good biological science". Vouchered specimens are used for taxonomic quality control, public education, staff training, research and evidence in beneficial use attainability, status and environmental investigations. To serve these purposes, enough specimens of each species from each site should be vouchered to document the range of size and individual characteristics of each species at a site. This documentation can normally be accomplished by collecting five or six specimens of each species from the site.

Vouchering fish specimens must comply with any applicable scientific collection regulations and restrictions. The DEQ uses the Orma J. Smith Museum of Natural History, Albertson College of Idaho, Caldwell, ID as our depository for fish (and macroinvertebrate) voucher specimens. DEQ fish collection permits need to specify the Orma J. Smith Museum as the depository for the vouchered material. A photocopy of the collection permit is also needed by the museum to document legal possession of vouchered materials.

Vouchering Procedures:

Step 1: Place live specimens in 10% formalin solution as a fixing agent. Using live specimens allows the formalin solution to be ingested and respirated into the interior organs and tissues of the fish. Specimens over 300 mm (one foot) in maximum total length must have a small incision made in the abdomen and/or have formalin injected into the large muscles.

Step 2: Allow the fixed specimens to remain in the formalin solution from 24 - 72 hours depending on their size. 24 hours is normally sufficient for live specimens less than 150 mm. If in doubt, or unsure, or the fish were dead prior to placement in the formalin, leave the fish in the formalin longer. Be sure all the specimens are totally covered with formalin.

Step 3: Completely fill out two DEQ fish specimen labels with No. 2 pencil or alcohol/formalin proof pen such as the Sakura Micron Pigma. Let any ink used dry completely before placing in the sample container. Make an initial field indentification of the specimens being vouchered. Place one label in with the vouchered fish. Tape the other to the outside of the sample container.

Step 4: Note on field data sheet which specimens or species are being vouchered.

Step 5: Send a legible copy of the field data sheets, a copy of the collection permit and the specimens to Don W. Zaroban (1410 N. Hilton Street, Boise, ID 83706, phone number: (208) 373-0260).

Appendix V. 1996 Beneficial Use Reconnaissance Project Field Audit Forms

Field Audit Form Crew Id:______________ SiteID:______________

Audit Date:______________ Auditors:______________

Is the equipment properly maintained?	Yes	No
Hess Net		
GPS Unit		
Flow Meter		
Electrofisher		
Inclinometer		
Spherical Densiometer		
Vehicle		
Remaining Equipment		

Comments:

Was there sufficient office preparation?	Yes	No
Copies of Field Forms		
Set of maps		
Preservative		
Sample Bottles		
First Aid Equipment		
All Field Equipment loaded		

Comments:

Site Selection

	Yes	No
Is the site representative of the stream?		

Rationale behind selection:

Comments:

Do you concur with:	Yes	No	Comments:
Total Reach Length			
Activities affecting reach			
Channel Type			
Valley Type			
Sinuosity			

Comments on Crew Teamwork

Macroinvertebrates	Yes	No
Was the protocol followed?		
If no, were deviations noted?		
Was there a minor compromise of the data?*		
Was there a major compromise of the data?**		

Comments:

Discharge	Yes	No
Was the protocol followed?		
If no, were deviations noted?		
Was there a minor compromise of the data?*		
Was there a major compromise of the data?**		

Comments:

Pebble Counts	Yes	No
Was the protocol followed?		
If no, were deviations noted?		
Was there a minor compromise of the data?*		
Was there a major compromise of the data?**		

Comments:

Canopy Closure	Yes	No
Was the protocol followed?		
If no, were deviations noted?		
Was there a minor compromise of the data?*		
Was there a major compromise of the data?**		

Comments:

Longitudinal Habitat Dist.	Yes	No
Was the protocol followed?		
If no, were deviations noted?		
Was there a minor compromise of the data?*		
Was there a major compromise of the data?**		

Comments:

Streambank Condition	Yes	No
Was the protocol followed?		
If no, were deviations noted?		
Was there a minor compromise of the data?*		
Was there a major compromise of the data?**		

Comments:

Innovations used by the team that should be incorporated statewide:

* Data usable requires calibration ** Data not usable - refer to TAC

Habitat Assessment	Yes	No
Was the protocol followed?		
If no, were deviations noted?		
Was there a minor compromise of the data?*		
Was there a major compromise of the data?**		

Comments:

Width/Depth	Yes	No
Was the protocol followed?		
If no, were deviations noted?		
Was there a minor compromise of the data?*		
Was there a major compromise of the data?**		

Comments:

Pool Quality	Yes	No
Was the protocol followed?		
If no, were deviations noted?		
Was there a minor compromise of the data?*		
Was there a major compromise of the data?**		

Comments:

Fish Collection	Yes	No
Was the protocol followed?		
If no, were deviations noted?		
Was there a minor compromise of the data?*		
Was there a major compromise of the data?**		

Comments:

Additional comments or suggestions to improve data collection:

* Data useable, requires calibration

** Data not useable, refer to TAC

Electrofishing Field Audit Form

Name of water body: ______________________ Site ID#: ____________

Audit date: __________ Auditor(s): ______________________

Was there sufficient office preparation (basic monitoring)?	Yes	No
Literature search of previous fish surveys		
Stocking records		
Fish migration barriers		

If no, please comment.

	Yes	No
Does the crew have applicable federal and state permit(s)?		
Is the crew cardiopulmonary resuscitation certified?		

If no to either question, discontinue sampling.

Is equipment available and properly maintained?	Yes	No
Waders		
Rubber gloves		
Electrofisher		
Anode and Cathode		
Gas and Oil or Battery		
Dip nets		
Buckets		
Fish keys		
Camera		
Field data forms		
Anesthetic		
Scales (length and weight)		
Formalin personal protection equipment		
Preservative: 10% buffered formalin solution		
Specimen vouchering bottles		
Specimen vouchering labels		
Specific conductance meter		
Thermometer		
Polarized sunglasses		

If no, please comment.

Name of water body: ______________________ Site ID#: __________

Audit date: __________ Auditor(s): ______________________

	Yes	No
Is the site in the least disturbed condition prior to electrofishing?		
Did the crew use the least invasive electrofisher setting(s)?		
If no, please comment.		

Did the crew adequately sample the site?	Yes	No
Temporally		
Spatially		
Did the crew collect all fish species (including non-game)?		
If no, please comment.		

Did the crew adequately handle the fish specimen(s)?	Yes	No
Anesthesia		
Identification of Family Salmonidae		
Measuring (length and weight)		
Recovery		
If no, please comment.		

Did the crew adequately preserve the fish specimen(s)?	Yes	No
Personal protection		
Labeling		
Storage		
If no, please comment.		

	Yes	No
Was protocol followed? If no, note deviations from protocol.		
Was there a minor* compromise of the data?		
Was there a major** compromise of the data?		

* Data usable, requires calibration.

** Data not usable. Consult BURP Technical Advisory Committee.

Comments:

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Appendix VI. Formalin Health and Safety

All field and laboratory activities will be performed in accordance with the Occupational Safety and Health Administrations requirements for a safe work place. It is the responsibility of the participants to establish and implement the appropriate health and safety procedures for the work being performed. All field staff are expected to review and understand the Material Safety Data Sheet and the Chemical Fact Sheet for chemicals of concern provided by field staff supervisors. Field staff are instructed to immediately report to their supervisor the development of any adverse signs or symptoms that they suspect are attributable to chemical exposure.

The environmental samples scheduled to be collected during this project will be obtained from surface water bodies located in natural settings. Samples to be collected include fish specimens and aquatic macroinvertebrates. The sample stations and samples to be collected are not considered to be hazardous; however, sample preservation materials include formalin (formaldehyde) which requires prudent safety precautions by those collecting samples and those coming into contact with or disposing of samples collected during this project.

Hazardous Materials (Formaldehyde)

Commercial grade formalin contains 37 to 55 percent formaldehyde. The use of formaldehyde and its derivatives are regulated under 29 CFR 1910.1048. Formaldehyde is a suspected human carcinogen. Formaldehyde is highly flammable and is incompatible with strong oxidizers, strong alkalies, acids; phenols; and urea.

Formaldehyde Exposure Limits

There may be no safe level of exposure to a carcinogen so all contact with formalin should be reduced to the lowest possible level. The odor threshold of 0.83 parts per million (ppm) for formaldehyde serves only as a warning of exposure. The permissible exposure limit (PEL) for formaldehyde is 0.75 ppm averaged over an 8 hour work shift. The time-weighted average (TWA) for airborne concentrations of formaldehyde (STEL) is 2 ppm. The American Conference of Governmental Industrial Hygienist recommend airborne exposure limit to formaldehyde is not to exceed 0.3 ppm averaged over an 8 hour work period.

Respirators shall be used when 1) installing feasible engineering and work practice controls, 2) engineering and work practice controls are not feasible, and 3) engineering and work practice controls are not sufficient to reduce exposure to or below the Permissible Exposure Limit. Respirator use should be limited to an MSHA/NIOSH approved supplied air respirator with a full face piece operated in the positive mode or with a full face piece, hood, or helmet operated in the continuous flow mode. An MSHA/NIOSH approved self contained breathing apparatus with a full face piece operated in pressure demand or other positive mode is also recommended.

Formaldehyde exposure occurs through inhalation and absorption. Exposure irritates the eyes, nose, and throat and can cause skin and lung allergies. Higher levels can cause throat spasms and a build up of fluid in the lungs, cause for a medical emergency. Contact can cause severe eye and skin burns, leading to permanent damage. These may appear hours after exposure, even if no pain is felt.

Formaldehyde First Aid

If formaldehyde gets into the eyes, remove any contact lenses at once and irrigate immediately with deionized water, distilled water or saline solution. If formaldehyde contacts exposed skin flush with water promptly. If a person breathes in large amounts of this chemical, move the exposed person to fresh air at once and perform artificial respiration if needed. When formaldehyde has been swallowed, get medical attention. Give large quantities of water and induce vomiting. Do not make an unconscious person vomit.

Formaldehyde Fire and Explosion Hazards

Mixtures of air and free formaldehyde gas are highly flammable. Formalin is a combustible liquid, and presents a moderate fire and explosion hazard. Use a dry chemical, carbon dioxide, water spray, or "alcohol" form to extinguish formalin fires. Store formalin solutions in insulated, closed containers in a cool, dry, well ventilated area separate from oxidizing agents and alkaline materials. Protect formalin containers from physical damage.

Formalin Spill Procedures

In case of a spill or leak, eliminate all sources of ignition, provide adequate ventilation, notify supervisor and evacuate all nonessential personnel. Neutralize spilled formalin with aqueous ammonia or mix with sodium sulfite. Wash residues with dilute ammonia to eliminate vapor. Prevent runoff from entering streams, surface waters, waterways, watersheds, and sewers.

Formalin Work Area Controls

Work area locations at stream sampling stations will be selected to ensure adequate ventilation when sample container lids are removed. Work area locations will be located downwind from field crew activities and will be isolated from field crew traffic. A single field crew member will be designated and authorized to secure the formaldehyde work area at sampling stations. This crew member will ensure proper handling of sample containers and fish specimens and will be responsible for establishing proper precautions for minimizing field crew exposure to formaldehyde at sampling stations.

Formalin Work Area Practices

Formalin (formaldehyde) is being used in this protocol for the purpose of asphyxiation and preservation of fish specimens. Pre-labeled and pre-preserved plastic sample containers will be delivered to the field crew secured in large ice chests. Field crews will transport the containers in the coolers to the field sample stations. Fish specimens will be collected by hand and place into the sample containers. Container lids will be removed immediately prior to and closed immediately after fish specimens and specimen labels are placed into the sample container. Specimens will be placed into the sample container and minimize the amount of time the sample preservative is not contained. The sample container will be placed into a large plastic bag and secured in an ice cooler until delivered to the laboratory for analysis.

Formalin Personal Protection

Field crew members within the designated formalin work area at sample stations will wear a full face shield, impervious nitrile, butyl rubber, or viton gloves, boots and aprons, etc. to prevent excessive or prolonged skin contact. Contact lenses will not be worn within the designated formalin work area. No eating, drinking, or smoking will be allowed in the designated formalin work area.

Wash thoroughly after using formalin. Avoid transferring formalin from hands to mouth while eating, drinking, or smoking. Avoid direct contact with formalin. Remove contaminated clothing and launder before wearing. Contaminated work clothing should not be taken home. Contaminated work clothing should be laundered by individuals who have been informed of the hazards of exposure to formalin.